

Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the orchid *Caladenia amnicola* D.L.Jones as an ENDANGERED SPECIES under Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Caladenia amnicola D.L.Jones was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.5 (b), because the total number of mature individuals of the taxon is very low (<250).

The NSW Threatened Species Scientific Committee has found that:

1. *Caladenia amnicola* is a small terrestrial orchid described by Jones (2021) as: 'Leaf linear lanceolate, 100-150 x 5-6mm, hairy. Flower stem 200-350mm tall, slender, wiry, densely hairy, 1-flowered. Flowers 40-50mm across, green to yellowish green with red central stripes; sepals and petals with yellowish-brown clubs 5-15mm long. Dorsal sepal erect, 40-50 x 2-2.5mm, incurved. Lateral sepals stiffly spreading then obliquely decurved, 40-50 x 2.5-3mm, divergent. Petals similarly arranged, 25-40 x 1.5-2mm. Labellum delicately hinged, 14-18 x 13-17mm, dark green with a maroon apex; basal margins with 4-7 pairs of thin erect comb-teeth to 4mm long; midlobe margins with 6-10 pairs of blunt teeth to the apex; tip recurved. Basal calli c. 3mm long. Lamina calli to 2mm long, maroon, in 4 or 6 densely crowded rows nearly to the apex of the midlobe. Column incurved, 12-15 x 6-7mm, transparent with red flecks; basal glands ovoid, c. 2mm long, yellow with a short red stalk, shiny.'
2. *Caladenia amnicola* is restricted to a single location west of Armidale on the New England Tableland, northern NSW. Only one population is known, it is bisected by a bitumen road with all individuals occurring across a combination of private freehold tenure, travelling stock reserve and other Crown land. Targeted searches by recognised orchid botanists in and around the known population have failed to locate further plants (Copeland 2021).
3. The geographic distribution of *Caladenia amnicola* is highly restricted. Using all records included in Copeland (2021), an Area of Occupancy (AOO) of 4 km² was calculated. This was based on 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2022). Extent of Occurrence (EOO) was calculated as 0.021 km²; however, following IUCN (2022) guidelines this was set at 4 km² for assessment purposes to align with the definition for AOO as being an area within EOO.
4. Backhouse (2018) estimated a total population size of 'about 100 plants' for *Caladenia amnicola*, although it is unknown if this estimate was based on any systematic survey, and it is possible that the species may occur elsewhere in the region. The most recent targeted survey undertaken by Copeland (2021) located just 18 individuals on a single day in early December 2021, although in previous informal visits at this site Copeland

NSW Threatened Species Scientific Committee

observed closer to 50 plants. Repeat surveys across the known flowering period (November to January: Jones 1997, 2021) would likely reveal more individuals and provide a better estimate of population size by addressing detection issues associated with asynchronous flowering and grazing impacts. However, the total population at the single known location is expected to be very low. As no reliable and comprehensive population size estimates were made prior to Copeland (2021), there are insufficient data to determine if there is decline in the *C. amnicola* population.

5. No information is available on the reproductive ecology of *Caladenia amnicola*; however, insights can be gained from related *Caladenia* species (Backhouse 2018) and for the genus as described by Dixon and Tremblay (2009). All *Caladenia* taxa are herbaceous perennials which undergo an extensive period of dormancy where they die back to a subterranean tuber, which is replaced annually. During the pre-flowering period (late autumn to early winter), a single leaf is produced (usually triggered by winter rainfall) and is followed by a flowering stem if conditions remain suitable. Pollination in *Caladenia amnicola* likely relies on sexual deception with male thynnid wasps (Backhouse 2018). As in other *Caladenia*, if fertilisation occurs up to 30,000 seeds are likely produced per capsule and released close to parent plants, or occasionally these may be dispersed by wind further afield (Dixon and Tremblay 2009). Vegetative propagation may also occur, with daughter tubers produced distally or proximally, this process thought to compensate for low pollination rates in some species.
6. The dust-like seed of *Caladenia* will germinate only in the presence of moisture and the appropriate mycorrhizal fungus, and if no inoculation occurs after 3-4 months the seed may lose viability (Dixon and Tremblay 2009). Annual flowering and seed production is therefore critical to maintain seed bank levels, although seed release from just one capsule may be all that is required to do this. Compared with other Australian terrestrial orchids, the specificity of mycorrhiza in *Caladenia* is well researched; some interactions are highly specific, but others involve a wider diversity of fungi (Dixon and Hopper 2009).
7. Copeland (2021) identified three key threats for the ongoing persistence of *Caladenia amnicola*: drought, weed invasion, and potential land use change. Road widening, grazing, out-of-season fires, and illegal collection may also threaten the species. All threats have the potential to operate across its full geographical extent.
8. Rocky habitat supporting shallow soils is prone to prolonged dry periods, and some dieback of *Leptospermum brevipes*, which *Caladenia amnicola* occurs beneath, and eucalypt species was observed within *Caladenia amnicola* habitat following the 2018-19 drought (Copeland 2021). Most terrestrial orchid species can avoid the direct impacts of drought through non-emergence in a season, but recurrent drought over successive years will reduce starch reserves and possibly lead to death of individuals (Weston et al. 2005; Pfeifer et al. 2006). High incidence of recurrent drought may therefore pose a risk to the long-term stability of this species.
9. Invasive perennial grasses and herbs are also present within the *Caladenia amnicola* distribution, particularly along road verges. *Hyparrhenia hirta*, *Eragrostis curvula*, and *Coreopsis lanceolata* are noted by Copeland (2021), and there are likely to be additional weed species given the proximity of a main road to the population (c. 20 m), and use of part of the population as a travelling stock reserve. Left unchecked, these threats will

NSW Threatened Species Scientific Committee

progressively degrade orchid habitat and potentially reduce available inter-tussock spaces for new recruitment to occur.

10. The known extent of *Caladenia amnicola* encompasses land owned and managed as freehold, travelling stock reserve, and other Crown land. In 2021, nearly all plants occurred on freehold land within 25 m of the travelling stock reserve, and one individual was present within the crown land parcel. While the area currently supports remnant bushland, its long-term future is uncertain, and change in land management incorporating (for example) increased stock grazing may be detrimental to the population.
11. Almost all of the known *Caladenia amnicola* population currently occurs within 35 m of a bituminised, road. This road provides a significant regional east-west transport link from Armidale, and future roadworks may threaten current habitat and increase the reach of invasive weed species.
12. Grazing by herbivores (native or feral) is a potential threat to *Caladenia amnicola*, as for many other terrestrial orchid species (Wraith and Pickering 2020). Orchids invest heavily in seed production, with single capsules capable of dispersing many thousands of seeds (Brundrett 2007), providing a level of resilience to grazing pressure. Potential herbivores impacting on *Caladenia amnicola* may include invertebrates, macropods, wombats, rabbits, or hares. Birds (e.g. White-Winged Choughs, *Corcorax melanorhamphos*) also occasionally feed on orchids and their tubers (Duncan et al. 2005; Faast and Facelli 2009). Cattle and horses may be a further threat on freehold land if stock are permitted to graze during flowering periods. Grazing by native herbivores is only considered a threat if population numbers have been artificially elevated through, for example, the provision of additional water points (Duncan et al. 2005).
13. Out-of-season fire and illegal collection are additional potential threats. Out-of-season fires may threaten terrestrial orchids by burning at times (autumn-winter) when plants may have depleted starch reserves in their tubers and limited capacity to resprout. The proximity of the population to a road means that illegal collection could be a potential future threat.
14. *Caladenia amnicola* D.L.Jones is not eligible to be listed as a Critically endangered species.
15. *Caladenia amnicola* D.L.Jones is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a very high risk of extinction in Australia in the near future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

NSW Threatened Species Scientific Committee

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Endangered under Clause 4.5 (b).

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Data deficient.

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)

Assessment Outcome: Data deficient.

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species,
	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

NSW Threatened Species Scientific Committee

**Clause 4.4 - Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion C)**

Assessment Outcome: Data deficient.

The estimated total number of mature individuals of the species is:			
	(a)	for critically endangered species	very low, or
	(b)	for endangered species	low, or
	(c)	for vulnerable species	moderately low,
and either of the following 2 conditions apply:			
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):	
	(i)	for critically endangered species	very large, or
	(ii)	for endangered species	large, or
	(iii)	for vulnerable species	moderate,
	(e)	both of the following apply:	
	(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and	
	(ii)	at least one of the following applies:	
		(A)	the number of individuals in each population of the species is:
		(I)	for critically endangered species extremely low, or
		(II)	for endangered species very low, or
		(III)	for vulnerable species low,
		(B)	all or nearly all mature individuals of the species occur within one population,
		(C)	extreme fluctuations occur in an index of abundance appropriate to the species.

**Clause 4.5 - Low total numbers of mature individuals of species
(Equivalent to IUCN criterion D)**

Assessment Outcome: Endangered under Clause 4.5 (b).

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

NSW Threatened Species Scientific Committee

Clause 4.6 - Quantitative analysis of extinction probability (Equivalent to IUCN criterion E)

Assessment Outcome: Data deficient.

The probability of extinction of the species is estimated to be:		
(a)	for critically endangered species	extremely high, or
(b)	for endangered species	very high, or
(c)	for vulnerable species	high.

Clause 4.7 - Very highly restricted geographic distribution of species–vulnerable species

(Equivalent to IUCN criterion D2)

Assessment Outcome: Vulnerable under Clause 4.7.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
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Senior Professor Kristine French
Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

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NSW Threatened Species Scientific Committee.

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NSW Threatened Species Scientific Committee

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